Space Weather Forecast

Issued on Tuesday, 30 January 2024 at 01:28 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of further Minor or Moderate (R1/R2) radio blackouts. Possible glance from CME and Minor Geomagnetic Storm G1 midweek UTC. Ongoing Minor Solar Radiation Storm (S1) likely easing into the period.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity rose sharply to Moderate in the past 24 hours, with previously subdued occasional Common-class X-ray activity showing an increased cadence and amplitude to culminate in a Moderate-class flare from a large and complex sunspot region in the northwest at 29/0438UTC. This was a long-period flare and was accompanied by an energetic Coronal Mass Ejection (CME), an 'EUV wave' (rapidly-propagating ripple in extreme UV wavelengths across the Sun). This CME showed a 'shock' (envelope of interplanetary matter interacting with the CME), however the main thrust of the CME is expected to pass west of the Earth, crossing the radius of the Earth's orbit early in the UTC day of Wednesday 31 January. No other Earth directed CMEs observed in available imagery.

There are currently six sunspot regions on the disc, including three as yet unnumbered regions - one in the southwest, one in the southeast and one rounding the northeastern limb. Because most of the current regions now lie near the solar horizons, monitoring ability is more limited due to the narrow viewing angle. The as yet unnumbered region rounding the northeast limb appears moderately active though the current foreshortened view makes accurate analysis difficult and liable to change in the coming hours and days.

Solar Wind / Geomagnetic Activity: Solar winds showed a probable intermittent weak fast wind regime. The Solar wind varied from background to slightly elevated levels, between around 380-480km/s. The associated magnitude of the solar wind magnetic field was weak throughout, with the important north-south component also varying weakly with an erratic character.
The net result of the above solar wind measures was for provisionally Quiet to Unsettled geomagnetic activity.

Energetic Particles / Solar Radiation: High energy protons (solar radiation storms) showed a sharp and almost immediate rise across all measured energies in the wake of the large X-ray flare, with 10MeV peaking and subsequently plateauing at 33pfu around 29/0900UTC, while 100MeV peaked around 0.6pfu. This implies a relatively direct connection to Earth at present, as also hinted at by the 'snow' observed on some satellite imagery following the event (caused by energetic protons hitting the detector). 10MeV values saw a second rise from around 29/1300UTC, first to around 70pfu and then again from around 29/1615UTC to a peak of 140pfu around 29/1805UTC below slowly declining.

Four-Day Space Weather Forecast Summary

Solar Activity: There is now an increased daily chance of Moderate-class flares and a slight chance of isolated Strong-class flares as a result of increased activity in the large sunspot group

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in the northwest. This risk reducing somewhat into the period as this region departs the visible disk, with uncertain contributions from eastern solar horizon arrivals due in the four days.

Solar Wind / Geomagnetic Activity: Generally Quiet to Unsettled condition expected in association with faster wind influence initially, with a chance of Active intervals. The peak risk of geomagnetic activity into day 2 (31 Jan) associated with the 29/0438UTC Moderate X-ray flare-tied CME, with Active intervals likely and a chance of G1 Minor Geomagnetic Storms.

Energetic Particles / Solar Radiation: High energy proton flux is expected to remain above Minor Solar Radiation Storm S1 in the immediate term, with a decreasing chance through the first half of the UTC working week as levels are expected to wane in the absence of any further flare enhancement.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	40	1	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	40	30	30
Very Active	R3 to R5 X	No	5	5	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	90	30	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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